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TICK-BORNE DISEASE

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The following is a synopsis of the most important tick-borne diseases in the U.S, some information on signs and symptoms and a few comments on the geographic distribution of the diseases and infection risk in Louisiana. Also, several tips on avoiding infection with tick-borne diseases are included.

- **Lyme Disease**: This illness is transmitted to human hosts from mice and deer through the bite of *Ixodes scapularis* and *Ixodes pacificus* ticks. *Ixodes scapularis* ticks are found in Louisiana. Within seven to ten days after the tick bite, victims may experience a rash at the bite site. This rash may appear with a central area of clearing and is referred to as erythema migrans. Other associated symptoms are flu-like illness, headache and joint pain. If untreated, generalized neurologic, cardiac, skin and joint problems may occur weeks later. Long-term difficulties with fatigue, joint pain and neurologic deficits have also been reported. (Browne BJ; Edwards B; Rogers RL. Dermatologic emergencies. *Prim Care* 2006; 33(3): 685-95, vi)

  From 1992 to 2006, 248,074 cases of Lyme disease were reported from the United States and its territories, making Lyme disease the most commonly reported vector-borne illness in the U.S. Ninety-three percent of the cases were reported from Connecticut, Delaware, Massachusetts, Maryland, Minnesota, New Jersey, New York, Pennsylvania, Rhode Island and Wisconsin. More than 65% of patients report an illness onset in the months of June and July. (Bacon RM, Kugeler KJ, Mead PS. Surveillance for Lyme disease--United States, 1992-2006. *MMWR Surveill Summ* 2008; 57(10): 1-9.)

  Approximately five to ten "confirmed cases" of Lyme disease are reported each year from Louisiana. Therefore Louisiana is not considered a high risk area. Several anecdotal reports of cases are received by the Infectious Disease Epidemiology Section, Office of Public Health, Louisiana Department of Health and Hospitals (OPH), however, none fulfill CDC requirements for diagnosis. (OPH, Reportable Disease Database, 2007)

- **Human Monocytic Ehrlichiosis**: (HME) is a tick-borne rickettsial disease caused an organism referred to as *Ehrlichia chaffeensis*. Most cases are likely asymptomatic and result in very little to no illness. When illness does occur symptoms range from fever, headache, muscle ache, rash, nausea and/or vomiting to more severe symptoms such as altered mental status, lymph node swelling and clotting abnormalities. The disease may cause several laboratory abnormalities, indicating involvement of several organs. Most cases are reported from Missouri, Kentucky, Tennessee, North Carolina, Arkansas, Georgia, Maryland and Oklahoma. Cases are most frequently reported from April to September, a time of elevated tick activity.

(Schutze GE, Buckingham SC, Marshall GS, Woods CR, Jackson MA, Patterson LE, Jacobs RF. Human monocytic ehrlichiosis in children. *Pediatr Infect Dis J* 2007; 26(6): 475-9.) (Schutze GE. Ehrlichiosis. *Pediatr Infect Dis J* 2006; 25(1): 71-2.) The primary vectors of HME are the Lone Star tick, *Amblyomma americanum* and the American dog tick, *Dermacentor variabilis*.

This disease may be underreported. Serosurveys indicate that many children in areas that harbor these tick species do have antibodies to this organism, indicating exposure. (Schutze GE. Ehrlichiosis. *Pediatr Infect Dis J* 2006; 25(1): 71-2.) Since both tick species are found in Louisiana, one can conclude that there is risk of being infected with this organism, although illness is uncommon. (Anderson JF, Magnarelli LA. Biology of ticks. *Infect Dis Clin N Am* 2008; 22: 195-215.)

- **Human Granulocytic Anaplasmosis**: (HGA) was once referred to as Human granulocytic ehrlichiosis. The causative agent is another rickettsial organism, *Anaplasma phagocytophilum*. The disease is characterized by fever, chills, headache, muscle soreness, joint pain, fatigue, lack of appetite and/or low white blood count and other laboratory abnormalities, as with HME. The presence of a rash is not a consistent finding and the disease is generally milder than HME, although the conditions are, in essence, indistinguishable. HGA is also reported primarily from April to September. The deer tick, *Ixodes scapularis*, also a vector of Lyme disease and babesiosis, is the primary vector. (Schutze GE. Ehrlichiosis. *Pediatr Infect Dis J* 2006; 25(1): 71-2.) (Dandache P, Nadelman RB. Erythema migrans. *Infect Dis Clin North Am* 2008; 22(2): 235-60, vi.) (Botelho-Nevers E, Raoult D. Fever of unknown origin due to rickettsioses. *Infect Dis Clin North Am* 2007; 21(4): 997-1011, ix.) (Young CC, Niedfeldt MW, Gottschlich LM, Peterson CS, Gammons MR. Infectious disease and the extreme sport athlete. *Clin Sports Med* 2007; 26(3): 473-87.)

  HGA is reported primarily from the upper Midwest and northeastern United States, therefore risk of infection in Louisiana is minimal. (Young CC, Niedfeldt MW, Gottschlich LM, Peterson CS, Gammons MR. Infectious disease and the extreme sport athlete. *Clin Sports Med* 2007; 26(3): 473-87.)

- **Colorado Tick Fever**: This disease is caused by a virus, Coltivirus (Reovirus). The wood tick, *Dermacentor andersoni*, is identified as the tick responsible for transmission to humans, however several other species of ticks have been found to be infected with the virus and likely play a role in the maintenance of the disease in nature. The wildlife reservoirs include the squirrel, chipmunk, porcupine, deer mouse and bushy tailed wood rat. Two hundred to 400 cases are reported annually, however this number is likely under-reported.

  Symptoms of infection include fever and chills, headache, muscle ache, stiff neck, light intolerance, fatigue, weakness and in some cases, a macular, maculopapular or petechial rash (rash in 5%-15% of cases). More severe symptoms such as pharyngitis, nausea/vomiting, abdominal pain, spleen enlargement and diarrhea have been reported; neurologic manifestations are reported even more infrequently. Death from the disease is very rare. Most cases are reported from May to July.

  The geographic distribution of the disease corresponds to the range of the wood tick, a topographic distribution in an area including the Rocky Mountains and Black Hills at elevations of

4000 to 10,000 feet. The risk of acquiring this disease in Louisiana is essentially zero. (Romero JR; Simonsen KA. Powassan encephalitis and Colorado tick fever. *Infect Dis Clin North Am* 2008; 22(3): 545-59.)

- **Powassan**: This disease is caused by a type of virus known as a flavivirus, a member of the same viral family that causes West Nile disease. There are two distinct lineages of Powassan virus that coexist in North America, classical Powassan and "Deer Tick virus". Most of these infections are symptomatic or result in mild symptoms. More severe neuroinvasive symptoms are encephalitis, meningoencephalitis and less commonly, meningitis; however, less than 40 cases of Powassan neuroinvasive disease have ever been recorded. The prototypical Powassan virus is maintained most frequently in groundhogs with the most common tick vector being *Ixodes cookie*. The "Deer Tick virus" is maintained primarily in the white footed mouse and is transmitted primarily by *Ixodes scapularis*. There are, however, at least two other *Ixodes* species (*I. marxi* and *I. spinipalpus*), and the *Dermacentor andersoni* tick that are also capable of transmission. In addition, 38 mammalian species have been infected, with the American red squirrel (*Tamiasciurus hudsonicus*) serving as an additional capable reservoir.

  Infection is usually seasonal, most commonly in the summer and fall. Evidence of infection with Powassan virus has been found in several areas of North America (Alberta, British Columbia, New Brunswick, Nova Scotia, Ontario, Quebec, California, Connecticut, Maine, Massachusetts, New York, South Dakota, Vermont, West Virginia, Wisconsin and Sonora in Mexico).(Romero JR; Simonsen KA. Powassan encephalitis and Colorado tick fever. *Infect Dis Clin North Am* 2008; 22(3): 545-59) Although the disease has never been identified in Louisiana, the widespread occurrence of infection and apparent existence of several capable reservoirs indicates a possibility that the disease might occur. However, one must remember that this disease remains rarely diagnosed.

- **Babesiosis**: The causative agent, most commonly *Babesia microti* (*B duncani* – northern California and Washington; *B divergens* – Missouri, Kentucky and Washington), of this disease is a protozoan from the same phylum as the causative agents of malaria, toxoplasmosis and cryptosporidiosis. *Babesia* species have long been implicated in diseases of domestic animals, but in the past 50 years these organisms have been increasingly identified as causes of human disease.

  Three distinct clinical syndromes have been observed in humans: mild to moderate flu-like disease that can persist for several weeks, severe disease in the immunosuppressed or elderly and asymptomatic infection. Severe complications of babesiosis include acute respiratory failure, congestive heart failure, liver and renal failure, splenic infarction and disseminated intravascular coagulation. This organism is transmitted by the same tick vector, *Ixodes scapularis* and the same reservoir hosts as Lyme disease. Although babesiosis is less common and is less commonly found in ticks and rodents than the Lyme disease organism (*Borrelia burgdorferi*), incidence may be increasing.

  Areas of greatest risk in the United States are the same as areas of greatest risk for Lyme disease. Cases are rarely reported in areas outside of the Northeast and Midwest, but a slight possibility of infections cannot be totally discounted in Louisiana. Human babesisosis has also been reported from other parts of the world.(Vannier E; Gewurz BE; Krause PJ. Human babesiosis. *Infect Dis Clin North Am* 2008; 22(3): 469-88)

- **Tularemia**: The symptoms of this disease vary widely. Some people do not have any symptoms, but this disease also can be severe, causing septic shock and death. Common symptoms include fever, chills, headache and a general sick feeling (malaise). Many people also develop a single, red ulcerated lump with a central scab and tender, swollen lymph nodes in the area. A small number of patients develop pneumonia. This disease does exist in Louisiana wildlife and has been isolated from ticks in Louisiana. Therefore there is a risk of acquiring tularemia in Louisiana.

- **Rocky Mountain Spotted Fever**: Symptoms include fever, headache, a spotted rash on wrists and ankles and a patchy rash on arms and legs. Muscle aches (myalgia), nausea, vomiting and abdominal pain are also common. It is now recognized that this disease is broadly distributed throughout the continental United States, as well as southern Canada, Central America, Mexico and parts of South America. Between 1981 and 1996, this disease was reported from every U.S. state except Hawaii, Vermont, Maine, and Alaska. Therefore there is risk, although small, of being infected with Rocky Mountain Spotted Fever in Louisiana.

  Limiting exposure to ticks is the most effective way to reduce the likelihood of acquiring a tick-borne disease. In persons exposed to tick-infested habitats, prompt careful inspection and removal of crawling or attached ticks is an important method of preventing disease. It may take several hours of attachment before organisms are transmitted from the tick to the host. It is unreasonable to assume that a person can completely eliminate activities that may result in tick exposure. Therefore, prevention measures should be aimed at personal protection:

  - Wear light-colored clothing to allow you to see ticks that are crawling on your clothing.
  - Tuck your pants legs into your socks so that ticks cannot crawl up the inside of your pants legs.
  - Apply repellants to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing, and will last for several days. Repellents containing DEET (n, n-diethyl-m-toluamide) can be applied to the skin, but will last only a few hours before reapplication is necessary. Use DEET with caution on children. Application of large amounts of DEET on children has been associated with adverse reactions.
  - Conduct a body check upon return from potentially tick-infested areas by searching your entire body for ticks. Use a hand-held or full-length mirror to view all parts of your body. Remove any tick you find on your body. Parents should check their children for ticks, especially in the hair, when returning from potentially tick-infested areas. Additionally, ticks may be carried into the household on clothing and pets. Both should be examined carefully.
  - To remove attached ticks, use the following procedure: 1. Use fine-tipped tweezers or shield your fingers with a tissue, paper towel, or rubber gloves. When possible, persons should avoid removing ticks with bare hands. 2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. (If this happens, remove mouthparts with tweezers.)(Schutze GE, 2006)